MANOA WONDER, NEW ROOT-KNOT NEMATODE RESISTANT POLE BEAN

Richard W. Hartmann

CIRCULAR 67
FEBRUARY 1968

HAWAII AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF HAWAII

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ACKNOWLEDGMENTS

The author wishes to acknowledge the cooperation of Dr. David Williams of the Maui Branch Station; Dr. Joseph A. Crozier, Jr., of the Kauai Branch Station; Dr. Philip J. Ito of the East Hawaii Branch Station; Mr. Noboru Kanda, Farm Manager at Poamoho Farm; and Mr. Choki Higa, Farm Manager at Manoa Farm in growing and collecting data from the replicated yield trials.

THE AUTHOR

Dr. Richard W. Hartmann is Assistant Horticulturist at the Hawaii Agricultural Experiment Station, College of Tropical Agriculture, University of Hawaii.

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In Hawaii and many other areas, particularly in the tropics, the presence of root-knot nematodes (**Meloidogyne incognita**) often limits the yield of vegetables and other crops. Since control by fumigation is usually costly and is effective for only a limited length of time, an effort is being made at the Hawaii Agricultural Experiment Station to incorporate root-knot nematode resistance into various vegetable crops. 'Manoa Wonder' is the result of a breeding program to incorporate this resistance into the type of pole snapbean (**Phaseolus vulgaris**) preferred in Hawaiian markets.

'Manoa Wonder' is similar to the presently-grown 'Hawaiian Wonder,' except for resistance to root-knot nematodes (Figure 1). Both are pole beans with lavender flowers; long, flat, light green pods with strings; and brown seed. 'Manoa Wonder,' however, is slightly superior to 'Hawaiian Wonder' in general appearance, straightness, and stringiness with a somewhat lower tendency to become shorter in later harvests.

'Manoa Wonder' is a selection from the progeny of a cross between 'Alabama No. 1' and 'Hawaiian Wonder.' 'Alabama No. 1' is a black-seeded,

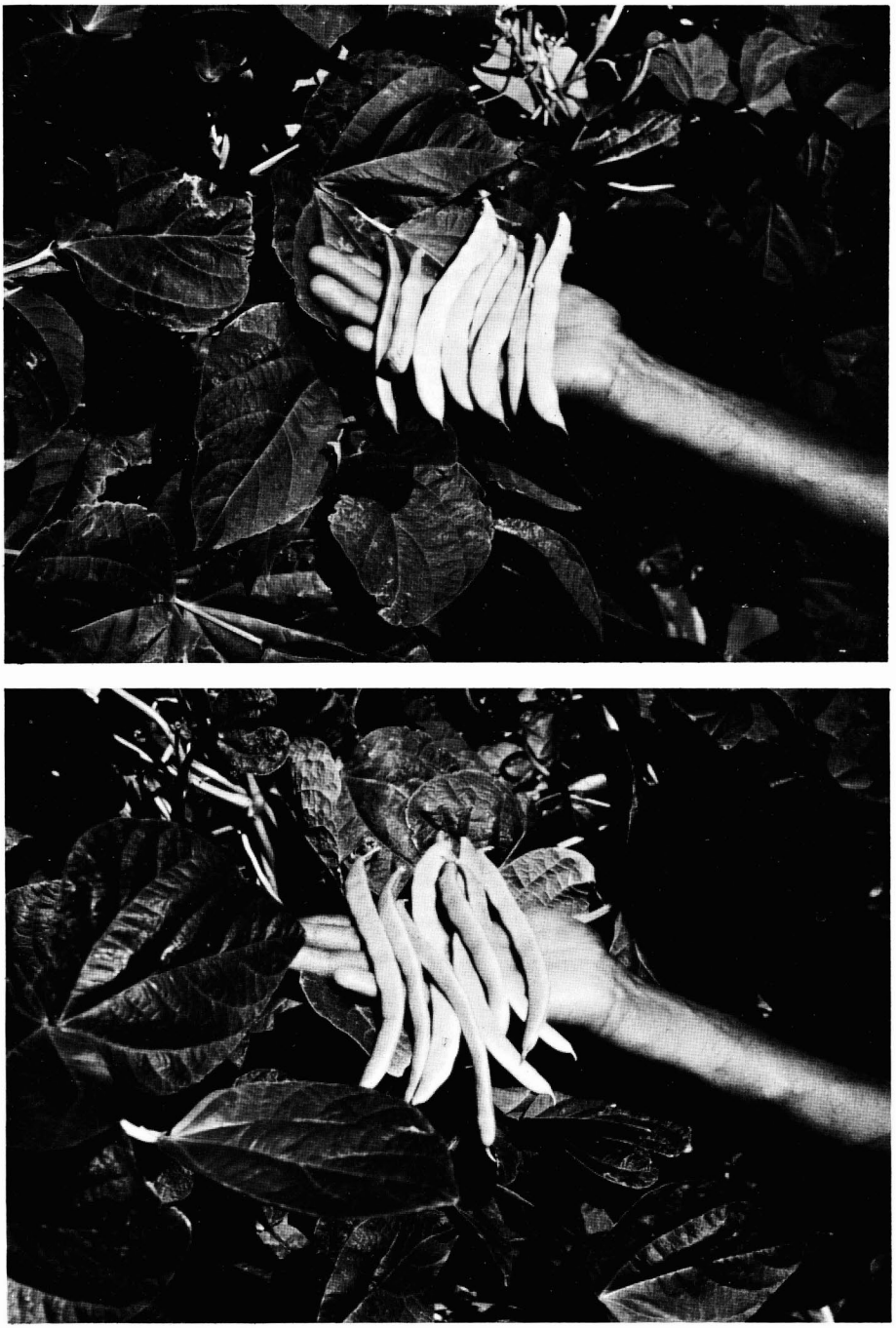

Figure 1. Top, 'Hawaiian Wonder'; bottom, 'Manoa Wonder' (two weeks after first harvest).

round-podded pole bean about 6 inches long which was used as the source of nematode resistance (Isbell, 1931). 'Hawaiian Wonder,' the variety now grown for local consumption, was selected from a cross of 'Kentucky Wonder' and 'Lualualei' (Frazier and Hendrix, 1949) and is brown-seeded, flat-podded, and about 7 inches long. It is also partly resistant to bean rust, although this resistance is often below the level desired. Progenies of the cross of 'Alabama No. 1' and 'Hawaiian Wonder' were selected for root-knot nematode resistance, pod shape and length, earliness, flavor, and productiveness through the F7 generation. All selection work was performed at the Poamoho Experimental Farm of the University of Hawaii, where a heavy and reliable population of root-knot nematode is found in several fields.

Five F7 lines equal or superior to 'Hawaiian Wonder' were selected for replicated yield trials at six experimental farms in Hawaii: Kapaa on Kauai, Poamoho and Manoa on Oahu, Kula on Maui, and Waiakea and Hamakua on Hawaii. At each station, three replications of each line were planted. Each replication was one 25-foot row with plants 1-foot apart. All vines were staked and were harvested either two or three times per week (depending on labor availability at the particular farm) for a period of 6 to 7½ weeks. Total weight was recorded for each harvest; length of 10 pods was recorded at various times during the harvesting season. The breeding line that performed best in these trials was selected for introduction and named 'Manoa Wonder.'

Data for 'Hawaiian Wonder' and 'Manoa Wonder' are represented in Table 1. It can easily be seen that yield varied considerably from farm to farm.

Table 1. Yield and pod length of 'Manoa Wonder' and 'Hawaiian Wonder' pole beans at six experimental farms in Hawaii

Farm	Kapaa (Kauai)	Poamoho (Oahu)	Manoa (Oahu)	Kula (Maui)	Waiakea (Hawaii)	Hamakua (Hawaii)	Average (All farms)
Yield[1]							
Manoa Wonder	26.9*	14.2*	32.0°	40.1**	23.2°	28.7°	27.5**
Hawaiian Wonder	21.8	8.0	30.7	29.5	20.1	26.9	22.8
Length[2]							
Manoa Wonder	7.4°	7.0**	7.5**	7.4**	7.3*	6.4°	7.2**
Hawaiian Wonder	6.9	6.0	7.2	7.1	6.3	6.2	6.5

[1]Average of three replications in thousand pounds/acre.
[2]Average of all readings for farm in inches.
°Difference not significant.
*Difference significant at .05 level.
**Difference significant at .01 level.

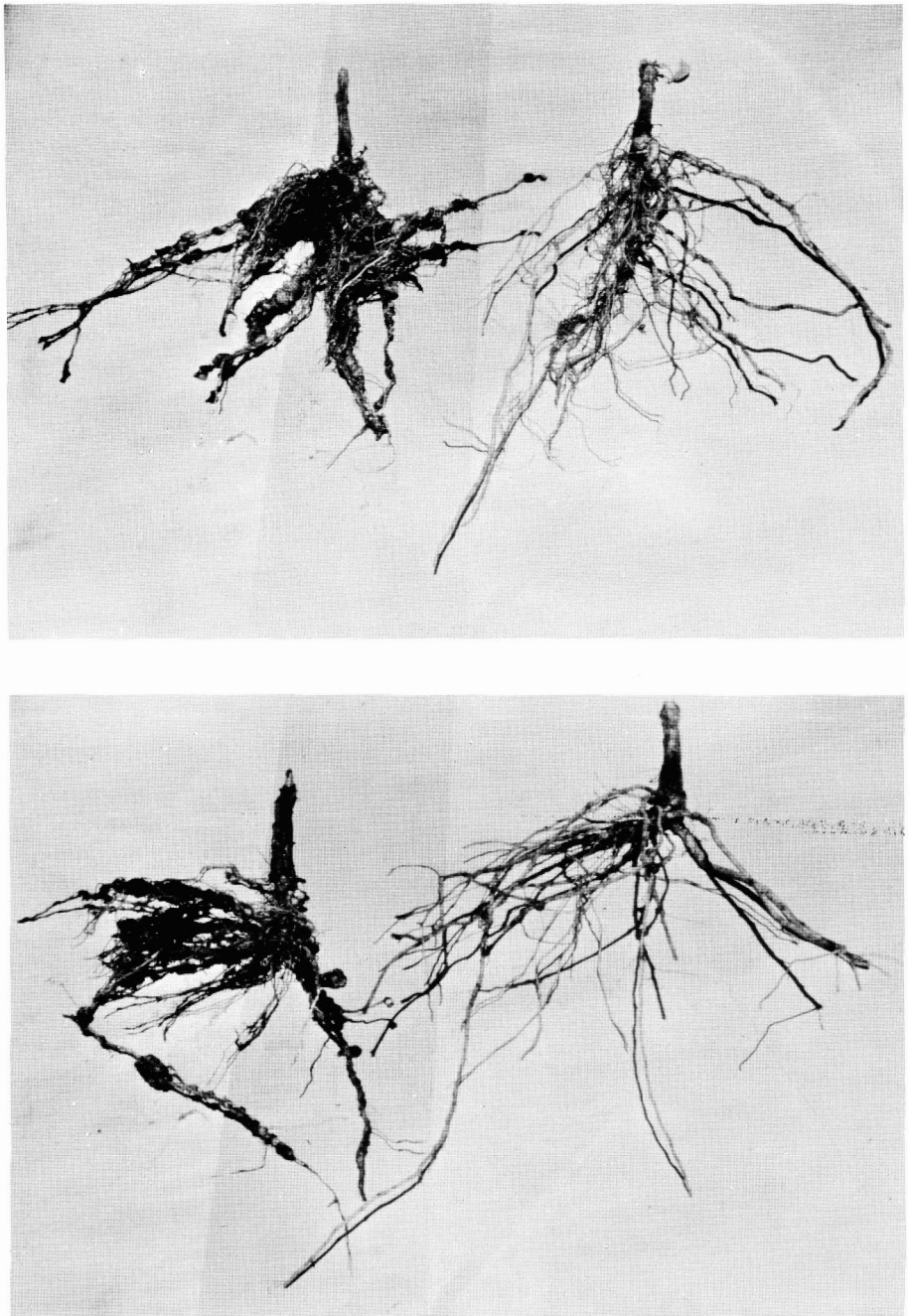

Figure 2. Effect of root-knot nematodes on bean roots. Left, 'Hawaiian Wonder'; upper right, 'Manoa Wonder' with no apparent galls; lower right, 'Manoa Wonder' with a few small galls.

Yields were generally best at Kula and poorest at Poamoho. Although soil factors play a part at Poamoho, the most likely reason for the low yields at that farm was the heavy population of root-knot nematodes. Although 'Manoa Wonder' is resistant, it is not immune and some galls were found (Figure 2). Poamoho is the only station involved in these trials which also had a severe root-knot nematode infestation. However, regardless of the actual yields at any particular station, 'Manoa Wonder' yielded better than 'Hawaiian Wonder' in all cases, although the differences were significant only at Kauai, Poamoho, and Kula.

In general appearance (Figure 1), 'Manoa Wonder' was considered by nearly all cooperators to be superior to 'Hawaiian Wonder.' Both are long, flat-podded beans, but 'Manoa Wonder' averaged about ½ inch longer (Table 1). There is also a slight improvement in 'Manoa Wonder' in straightness and stringiness, although no detailed records were kept on these characters.

Under conditions of heavy nematode infestation, 'Manoa Wonder' is clearly superior. 'Hawaiian Wonder' generally has poor growth and early defoliation when galling is severe (Figure 3). Under field conditions of heavy root-knot nematode infestation, 'Hawaiian Wonder' exhibits very heavy galling,

Figure 3. Left, 'Manoa Wonder'; right, 'Hawaiian Wonder' showing early defoliation under conditions of heavy root-knot nematode infestation (three weeks after first harvest).

while 'Manoa Wonder' has roots which are mostly free of galls, but which may at times show light to moderate galling (Figure 2).

'Manoa Wonder' should perform as well as or better than 'Hawaiian Wonder' under Hawaiian conditions, as shown by replicated trials at six farms in various growing areas. Under conditions of root-knot nematode infestation, 'Manoa Wonder' should greatly outyield 'Hawaiian Wonder.'

LITERATURE CITED

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Isbell, C. L. 1931. Nematode resistance studies with pole snapbeans. J. Hered. 22:191-198,

SEEDS FOR TRIAL

Seeds, in limited quantities for trial, may be purchased from the Business Office, College of Tropical Agriculture, 2525 Varney Circle, University of Hawaii, Honolulu, Hawaii 96822.

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HAWAII AGRICULTURAL EXPERIMENT STATION
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